Persistence conditions of institutional entities: Investigating copredication and prototypicality through a forced-choice experiment

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Abstract: The conditions under which certain complex polysemous nominals can sustain coherent sense relations (informally, can “survive”) is investigated through a forced-choice experiment. The materials permitted copredication, through which multiple, semantically different sense types are associated with a single nominal. Participants were presented with two scenarios involving a certain polysemous nominal (e.g. *bank*, *city*) and had to select which scenario (and, hence, which combination of predicates) appeared to be the most prototypical, faithful realisation of the nominal. In order to achieve this, an additional manipulation was added, such that the number of senses hosted by each choice was either equal (2 senses choice vs. 2 senses choice) or unequal (1 sense choice vs. 2/3 senses choice). In order to address certain concerns in the literature about prototypicality, a core question was whether the institutional sense of the nominals strongly determined the option chosen by participants, or whether the number of senses more strongly predicted this. It was found that the best predictor of the results was not sense frequency, but rather sense complexity or approximation to the institutional sense.

Introduction

In a recent discussion on the nature of consciousness, Chomsky (2018: 38) considers “one of the most ancient problems of philosophy: How can we cross the same river twice?” These are problems of “identity” and “individuation” for Chomsky. Relatedly, Collins (2017: 680) presents an example demonstrating how river can license copredication through it being a geographical feature, an abstract relation or a body of water:

‘The Nile runs the length of Egypt and it serves as the most important trade route in the region as well as the source of irrigation for nigh-on all of Egypt’s crop production.’

This issue has been discussed in the philosophical literature (witness Collins 2017: 686: “Thus, a group of people and a geographical area wildly dissociate in every conceivable sense save for them being referred to by *London*, say. We can kill the population of London, but not the area in south-east England. Equally, we can burn the city down while sparing the people, but rebuild the same city elsewhere, with a new population”), but not in the experimental literature.

Cognitive models of polysemy have suggested that vagueness, polysemy and homonymy represent “a cline of diminishing schematicity and increasing instances of salience” (Lewandowska-Tomaszczyk 2007: 139), such that polysemous senses bear a lower degree of salience than homonymous meanings do, and vague words have an even lower degree of salience for a particular meaning. For instance, *student* is not polysemic with respect to the distinction between *young student* and *old student* (‘I gave the book to a student but not to a student’ cannot refer to an old and young student respectively); it is vague and unmarked. In a similar way that one would typically say ‘Milton Keynes is close to London’ and not ‘London is close to Milton Keynes’, due to proximation to a larger city being seen as a prototypical frame of geographical reference (i.e. if given the choice, most people would likely opt to say the former sentence), it may be that there is an empirically detectable range of sense prototypicality in polysemy such that one sense may invariantly be seen as more essential to the polysemous nominal than others.

The main set of prototype effects are plotted in Table 1 (loosely adapted from Lewandowska-Tomaszczyk 2007: 151, and modified to focus on the form of polysemy explored here). This shows how degrees of salience, clustering of senses, a lack of clear necessary and sufficient features, and variability in category membership are hallmarks of prototype effects. Table 1 plots effects relating to *extensions* and *intensions*, which are, respectively, entities referred to by the concepts and senses which the concepts are composed of. These effects can in turn be categorised based on whether they effect the salience of the sense (how clear and prominent it is in a given interpretation) or its discreteness (related to issues of demarcation).

	Extentionally	Intensionally
<i>Salience</i>	Differences of salience among senses	Clustering of senses into nominal representations
<i>Discreteness</i>	Senses can demarcate different entities	Absence of definitions in terms of necessary and sufficient features

Table 1: Main prototype effects and their mutual relationships.

As the framework depicted in the above table would predict, it has been found that people tend not to categorise objects using necessary and sufficient features, but rather do so by comparing their similarity to a prototype of the candidate category (Rosch 1975, 1978). As such, when judging whether a cluster of senses in a given context constitutes a *school* or not, comprehenders will presumably compare this structure to their stored prototypical representation.

Yet, the main theoretical difficulty in discussing this topic surrounds the issue of what precisely constitutes the prototype. As Gries (2015: 473-474) notes, the prototypical sense of a word could be the most frequent, most salient, most concrete, or the earliest acquired sense, and it is furthermore likely that the criteria of prototypicality differs across nominal classes. As such, there seems little fundamental connection between prototype structure and the models of polysemy; rather, the prototype is a representation likely independent of semantic or pragmatic processes (Murphy 2016) and, as mentioned, the criteria for being a prototype likely differs across word classes and conceptual domains.

As Geeraerts (1989) also proposed, there are certain concepts (for our purposes, INSTITUTION-related polysemous nominals) which may not be able to be defined through a set of necessary and sufficient features, and which exhibit a semantic structure which assumes the form of a set of clustered and overlapping interpretations. For example, ‘The school with large windows starts at 9am and has a strict headmaster and unruly students’ contains a number of clustered senses being attributed to a single nominal. However, it may be the case that one of these senses is more salient and prototypical than the others, but intuition alone does not seem a powerful enough measure to expose this (none of the *school* senses seems to be the most prototypical). As such, behavioural data is needed.

All of these effects are clearly present in a particular instantiation of polysemy known as *copredication*, whereby multiple, semantically different sense types are associated with a single nominal (“Lunch was delicious but was delayed”; “The newspaper that I held this morning has been sued”). Progressing on from recent research into the acceptability dynamics of copredication (Murphy 2019, 2021) and possible lower-level accounts (Murphy 2018, 2020), I will investigate what I will term the *persistence conditions* of copredication, making close contact with the nature of prototypical copredications. The main research question will be ‘What are the conditions under which the identity of a given entity can survive?’ This will act as a refined, controlled version of the classical Ship of Theseus paradox and Heraclitus’s river paradox.

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99 **Materials and Methods**

100 *Materials*

101 The purpose of the present experiment was to present participants with scenarios involving a
102 certain nominal (e.g. *bank*, *city*) and afterwards to present them with a forced-choice to
103 determine which outcome of the scenario (and, hence, which combination of predicates)
104 appeared to be the most prototypical, faithful realisation of the nominal. In order to achieve
105 this, an additional manipulation was added, such that the number of senses hosted by each
106 choice was either equal (2 senses choice vs. 2 senses choice) or unequal (1 sense choice vs. 2/3
107 senses choice).

108 A core question of interest was whether the INSTITUTION sense strongly determined the
109 option chosen by participants, or whether the number of senses more strongly predicted this.
110 Addressing this question required balancing the number of scenarios in which the institution
111 sense appeared either in isolation or with other senses. As such, in 3 scenarios the institution
112 sense was isolated, in 3 scenarios it appeared with other senses while a different sense (e.g.
113 PHYSICAL) was isolated, and the 6 other scenarios contained an equal number of senses.

114 The scenarios involved a forced-choice between two qualified (licensed/acceptable)
115 copredications of differing types, with participants being asked to choose *Which is the bank?*
116 or *Which is the city?* 12 narratives were constructed, 6 of which presented two options
117 exhibiting an equal number of senses and the other 6 presented two options with an unequal
118 number of senses. The narratives themselves exhibited all of the senses in the choices for
119 participants. The central question which arises here is: ‘What determines the more popular
120 choice amongst participants?’ One possibility is *sense frequency*, i.e. participants will choose
121 whichever option hosts the most frequent sense. Another possibility is *sense complexity*, with
122 the most semantically complex sense (the one able to host the greatest number of senses and
123 which is related to the greatest number of ‘core knowledge systems’ or cognitive modules;
124 Carey 2009) determining true or prototypical objecthood for a given nominal.

125 Narratives of the following type were constructed (see Appendix for full list). In the
126 experiment, each narrative was followed by a choice: ‘Which is the X?’:

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128 *Library:* A library catches on fire and is shut down. A new building across the street
129 with self-service machines is built to help the public take out books. However, the
130 employees of the original building protest and insist that the old library can simply
131 be repaired, and refuse to hand over most of the books to the new building.

Choice: Old building – New building

Senses: Physical, People – Physical, Process

Village: The King of a medieval village becomes corrupt and so the folk stage a rebellion, burning down the whole place in the process. Taking the village's original architects and main political leaders with him, the King relocates to a new site to accurately rebuild it. The village's entire population, however, move to a different site and also bring with them one of the original architects who helps them rebuild.

Choice: King's site – People's site

Senses: Physical, Polity – Physical, Populace

6 fillers were also used to ensure participants were paying attention, with these narratives having much clearer, more obvious answers. These were of the following kind:

Sandwich: John decides to make a sandwich. He slices it in half, begins to eat the first half, but then finds the bread very hard and difficult to swallow. He decides to take the second half and blend it into a smoothie.

Choice: First half – Second half

Chair: Sarah builds a chair and takes a photo of it. She then demolishes the chair and uses the material to build a small desk.

Choice: Chair – Desk

After the presentation of the forced binary choice, participants were tasked with selecting one option from a 1-5 confidence metric, introduced by the question 'How confident are you about your choice?' This allows us to differentiate between cases in which participants strongly believed in their choice, and cases when they were more ambivalent. Finally, to ensure that participants paid attention, they were forced to explain their reasons for selecting either option.

Participants

79 native English speakers (average age: 36, range: 20-60, 60 female) took part in the experiment, sourced from Prolific Academic and having an approval rating on the site of at least 90%. Participants were paid £6 per hour, with the average finishing time being 10 minutes.

Results

Confidence Scores

The average confidence score for the fillers was 4.2 (ranging from 3.9 for *chair* to 4.5 for *fence*) and was lower (as predicted) for the experimental items (3.6). Confidence scores for the experimental items ranged from 3.01 (*city*) to 4.06 (*bank*), suggesting that the responses can be taken as an accurate and genuine reflection of the participant's semantic intuitions. Confidence scores for experimental items can be found in Table 2.

NOMINAL	Score (1-5)
LIBRARY	3.75
Village	3.94
Factory	3.51
City	3.01
University	3.64
Town	3.71
Church	3.84
Shop	3.88
Bank	4.06
Company	3.29
Province	3.16
School	3.46

Table 2: Average confidence scores across all nominals.

Sense Type Score

Participants scored 'correctly' on all fillers, and the minority of deviations (constituting only 25 out of the 474 total responses) provided well-reasoned explanations. The results for the experimental narratives are plotted in Table 3.

Table 3: Average scores for all nominals, with 1 being Institutional sense selection and 0 being Non-Institutional sense selection, where *POLITY* is subsumed as an institutional sense and narratives involving no explicit institutional sense were sorted such that the sense closest to *INSTITUTION* acted as an institutional proxy (e.g. *POPULACE/EMPLOYEES* is more semantically related to *INSTITUTION* than *PHYSICAL*). See Discussion for the nature of the colour-coding.

A multiple regression analysis was conducted using SPSS 24 with Sense Equality (Equal vs Unequal) and Nominal (1-12 of the nominal list) as independent variables and Sense Type (Institution or Non-Institution) as the score. Sense Equality and Nominal statistically significantly predicted Sense Type ($F(2, 945) = 19.659, p < .001$). While Sense Equality added statistical significance to the prediction ($p < .001$), Nominal did not ($p = .438$). This was due to the average Sense Type score for the Unequal nominals being 0.59 (with 1 being Institution sense chosen, and 0 being Non-Institution sense chosen) but only 0.39 for the Equal nominals. This suggests that adding a greater degree of sense variability to each decision (e.g. Village #1 vs Village #2) resulted in a more stable role for the institutional sense in determining objecthood. Participants were much more willing to select a Non-Institution sense when the number of senses was matched across choices, but when the number of senses was unequal this seems to have exposed the possibility that the institutional sense was somehow more primary and essential (indeed, no Unequal nominal dropped below the .5 level), since when the number of senses is equal the (putative) primacy of the institutional sense would be harder for participants to detect, only becoming clear when they were forced to make a more stark choice between the institutional or non-institutional senses.

Discussion

The results from this brief experiment suggest that banks and universities are typically conceived along axes of functionality, whereas villages and towns are often conceived as more general geographical, spatial markers which more complex senses can be related to. There appear based on Table 3 to be three, easily categorizable types of institutional entities: low, moderate and high INSTITUTION-dominated nominals. *Village, town* and *factory* are clearly low-dominated (around 0.3 or less), *bank* is demonstrably high-dominated (0.8 or greater), and all other nominals are safely between 0.5-0.6, with *university* slightly above but still far below *bank*. These categories have been colour-coded in Table 3. These demarcations were established through levels of high confidence, with *village, town, factory* and *bank* all displaying high confidence scores.

Comparing the present results to those from a previous frequency experiment (Murphy 2018) allows us to determine whether the results were modulated by sense dominance. For *village* and *town*, PHYSICAL is the most frequent sense, which initially appears to predict the present results, yet participants made their decision based on the PEOPLE sense, not PHYSICAL, since both options hosted a PHYSICAL sense, and indeed both these decisions may have been more influenced by the POINT OF ORIGIN more than by PEOPLE. Either way, it is difficult to determine whether frequency was the determining factor. PHYSICAL is also the dominant sense of *factory*, and two new locations were part of this narrative so POINT OF ORIGIN played no role, and both choices also hosted a PHYSICAL sense, but as with *village* and *town* the PEOPLE sense appears to have determined the outcome; that is, the sense semantically closest to INSTITUTION (and also the most abstract sense) determined the outcome. While the participant's choices for *company, school* and *university* on average matched these nominal's dominant sense (INSTITUTION), twice as many other nominals (*province, city, library, church, shop, bank*) deviated from this.

In conclusion, the best predictor of the results was not sense frequency, but rather sense complexity or approximation to INSTITUTION. It was doubtless reasonable to hypothesise that frequency would have had at least some influence, not least because the present experiment was explicitly oriented towards pitting two objects against each other, with prototypicality (and hence frequency) likely being one of the best guides for participants to make a judgement. Yet, even under these circumstances, sense frequency was not the determining factor.

It might also initially appear that persistence conditions could more easily be explored by giving participants stages of decomposition, such that parts of a city (its people, institutions,

etc.) are removed one-by-one in a given scenario, with participants being asked ‘Is this a city?’ every step of the way. However, since objects can exist with only a single polysemous sense persisting this proposal would likely result in all participants (rightfully) selecting ‘Yes’ up to the point when the last sense remains. And so not only would this design not speak to the question of *core, essential* senses of complex polysemous nominals, it would also likely result in all participants claiming that each nominal survived the full destructive process simply because such a process would necessarily be a ‘sense-by-sense’ level of destruction, since this is the only level of granularity one can operate at (with the only other possibility being manipulating pragmatic factors such as the context the object denoted by the nominal found itself in, in which case we are back to the original design of the present experiment).

One potential objection to the present study is that it did not control for pragmatic factors, such as the tendency for participants to ‘side’ with the underdog against a putative antagonist, encouraging them to choose ‘People’s location’ over ‘King’s location’ for the *village* narrative. However, this objection does not stand up to scrutiny, since both *village* and *town* contain a clear ‘antagonist’ (the corrupt King representing the INSTITUTION sense and the violent gangs representing the POPULACE sense) but this did not predict responses, since participants on average chose the (‘good’) POPULACE-PHYSICAL senses for *village* but the (‘bad’) POPULACE-PHYSICAL senses for *town*, even when the PHYSICAL sense of *town* was described in the narrative as being doomed for demolition. Likewise, the majority of participants opted for the ‘antagonist’ PHYSICAL-INSTITUTION senses for *university* rather than the PHYSICAL-POPULACE senses. The notion of POINT OF ORIGIN therefore seems to play a role in individuating institutional entities like *town*, as it also does for *school*, *company* and *shop* – but not for *bank*, seemingly due to FUNCTION trumping POINT OF ORIGIN. For Pustejovsky (1995), these two notions of FUNCTION and POINT OF ORIGIN are respectively referred to as the TELIC and AGENTIVE Qualia roles. It appears that, much as how Pustejovsky originally claimed, different Qualia roles are foregrounded across different nominals based on context – although, going somewhat beyond this, the present experiment also suggests that the relations of these Qualia roles might exhibit a more robust, generalisable structure or hierarchy, such that the telicity of *bank* is foregrounded not simply due to context/narrative, but because of the internal structure of the senses which compose the (highly) polysemous nominal. This hypothesis ties in with Lang and Maienborn’s (2011: 719) interesting proposal that institutional nominals appear to have a common PURPOSE semantic feature (essentially Pustejovsky’s TELIC role), with the senses enveloping schools and banks and shops ultimately being centred on a core lexical

meaning: “[A] legal entity that organizes purposeful events to be performed and/or received by authorized groups of persons in specific locations”.

Lacking sense order manipulations, this experiment has shown that purely semantic and pragmatic factors enter into judgements. The findings do not square with Vicente’s (2017) claim that the INSTITUTION sense is necessary for the persistence of these nominal types, nor do they square with Arapinis’s (2013, 2015) belief that the multiple senses of institutional entities are “clustered in a symmetric structure” (2013: 35), since there is clearly variability in spite of the very strong trend in INSTITUTION-dominance. While there may be no such thing as a core, essential sense for any of the nominals discussed (with each nominal being a cluster of senses with pragmatic factors determining which one is brought to the fore), the results suggest that there is considerable variation in the level of INSTITUTION-dominance the sense-cluster of each nominal exhibits.

Appendix

Experimental Narratives

Factory: A factory goes out of business and so all the employees move to a new location to try and set up business. However, their new building is empty and they may not be able to perform their job. Meanwhile, in a third location some machines are set up to robotically perform factory tasks, but they lack any materials or managers.

Choice: Employee site – Machine site

Senses: Physical, Populace – Physical, Process

City: A city is burned down in an accidental fire. Its political leaders and half the population move to a new site, constructing a new style of buildings. The other half of the population, frustrated at this new style, move to a different site with the city’s original architects and faithfully construct the original style.

Choice: New style – Original style

Senses: People, Polity – People, Physical

University: The chancellors and managers of a university (St John’s University) decide to merge with a neighbouring university (St Catherine’s University), becoming a single university (St John & Catherine University). However, the

students of both universities and most of the teaching staff reject the merger, and decide to continue teaching and studying in the original buildings, refusing to cross the boundaries set by the original two universities.

Choice: St John's University – St John & Catherine University

Senses: Physical, Populace – Physical, Institution

Town: An old town is facing being demolished by the government. The population is mostly composed of thieves and corrupt, violent gangs, and they are strident in staying where they are, whereas the town's council and legal institutions decide to agree to the government's decision to move the town to a new location, rebuilding it faithfully. The population stay in the old, soon-to-be-demolished location, while the new town is being built.

Choice: Old town – New town

Senses: Physical, Populace – Physical, Institution

Church: A church catches on fire and is largely destroyed, and all the staff and most of the church's possessions are moved across the road to an abandoned building, which they gradually transform into a church through reconstruction. They continue to work in the new building but will most likely repair the old building at some point, since the new building only has a small number of physical features which they believe a church should have.

Choice: Old building – New building

Senses: Physical – Physical, People, Process

Shop: A bike shop goes out of business because of careless management. Frustrated, its employees move across town and begin to sell bikes in a new location. The owners of the original bike shop are soon forced out of their location because they cannot pay the rent, and are forced to move their headquarters to a new, cheaper building. They also have no employees to sell their bikes but retain the legal ownership of the firm's identity.

Choice: Employee shop – Owner shop

Senses: Institution – Process, Physical

Bank: The electricity grid powering a bank is shut down, and the bank's owners, employees and machinery are moved to a new building. The mechanics say they are unsure if they will be able to fix the original building's electricity problems, and the future of the company is uncertain.

Choice: Original location – New location

Senses: Physical – Institution, Process

Company: An insurance company has a large number of employees in its building. For tax reasons, the company bosses decide to move their headquarters to a different location. This new location serves as the base for the company bosses, while the employees remain in the old building and perform the work.

Choice: Employee building – Headquarters

Senses: Physical, People – Institution

Province: An earthquake totally destroys a province and all its infrastructure. Thankfully, the human casualties are minimal. However, while the government decides to build a new province upstream along the river and successfully rebuilds the original buildings, the vast majority of the population take this as a chance to start afresh, and decide to build a province downstream along the river, reconstructing some of the original buildings but mostly starting anew.

Choice: Government province – Population province

Senses: Physical, Polity – Populace

School: A large fire destroys a school at night. The headteachers and government managers claim that there is not enough money to form a new school at a different site, even though this could be done fairly quickly, and so they decide to gradually rebuild the original school. However, the parents and approximately half the teachers decide that this will take far too long, leaving the children out of education at a crucial time for the students. They manage to raise enough money to rebuild the school at a new site, becoming a newly-formed school. A few months later, the original building has been rebuilt, and the government is confronted with the difficult challenge of assigning funding, and new parents are confronted with the difficult decision of choosing between schools.

Choice: Government school, New school

Senses: Institution – People, Physical

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